D. FOLSOM

The Potato News Bulletin

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The Potato Association of America

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POTATO NOTES

San Francisco, Calif. — Planting was somewhat disturbed in the Los Angeles district by the protracted drought that obtained up to March 15, and the likelihood of irrigation water not being available. On March 15 a reasonable amount of rain fell and the shortage of water was somewhat allayed, however, the quarantine regulations in the hoof and mouth disease, interfered with planting just after the rain so it is rather difficult to tell just what the potato situation is in southern California. We believe the acreage outside the San Fernando Valley will be just about the same as last year, namely 5000 acres. The acreage in the San Fernando Valley will be reduced to about 2000 acres as against 5000 acres last year. Los Angeles district therefore will have 7000 acres as compared with 10000 last year, and normal acreage of from 15000 to 16000 acres.

The total acreage to be planted in the Stockton district — the alien law to the contrary notwithstanding — will be just the same this year as it was last year but this was less than normal. It is estimated that about 26,000 acres will be planted. There will be a larger per cent of the crop in this district available for harvest in July this year owing to earlier planting. It is therefore expected that during the months of July and August California will have a surplus over its own requirements. It is still too early to tell much about the crop in the Stockton district as it is just beginning to come through the ground. **Weyl-Zuckerman & Co., April 24, 1924.**

Hastings, Fla. — The writer spent April 7 to 9 in the Hastings district getting some first-hand information on the potato crop of that section. The growers were all agreed that this season has been a very unusual one for that locality. The season has been very cool and the precipitation so frequent and heavy that it has been difficult to provide sufficient drainage to carry off the water. In other words instead of being obliged to irrigate the crop the problem has been to keep it from being drowned out. Notwithstanding these unfavorable weather conditions the crop is going to be a fairly good one. An interesting feature of the Hast-

ings Spaulding Rose crop this season is that it was very largely planted with certified seed. The interest shown by the growers in certified seed potatoes this year is in striking contrast to that shown a few years ago, and augurs well for the future of the potato industry in the Hastings district.

In the Federal Point section harvesting operations were well under way on many farms and the yields in some instances were very gratifying. On the 9th a grower here and there outside of the Federal Point section was beginning to dig, evidently unable to resist the lure of a $9.00 to $10.00 per barrel f. o. b. price for No. 1 stock, even though the crop was not much more than two-thirds grown.

Very little disease was noted in most of the commercial fields and all that was needed to produce a large crop was satisfactory growing conditions the balance of April.

The double-headed barrel is the favorite container. They cost the grower 65c apiece.

The Hastings Potato Growers' Association expect to market a considerable portion of the potato crop this season. The peak of the movement is expected during the first week of May.

The Boggs Potato Grader is practically exclusively used by the Hastings growers.

The Burbee Distributing Co., Nix Produce Co., Hastings Potato Growers' Association and G. W. Waller are the largest handlers of the crop. The quality of the stock, if it remains dry throughout the shipping season, gives every promise of being good.—**W. Stuart.**

Mobile, Ala.— Friday, April 11, was spent in Mobile County in sizing up the potato crop of that section. The season is from one to two weeks later than usual but for the most part the crop where good stands have been secured, is looking well. The Triumph and Irish Cobbler are the favorite varieties in this section, with the larger acreage planted to Triumph.

Considerable certified seed stock was planted this season. The Gulf Coast Produce Company distributed either seven or eight carloads of seed among members of their co-operative association at $4.75 per 150 pound sack, while the other seed dealers charged 50c to $1.00 above this price for similar stock. The crop will not be harvested before the middle of May.

Louisiana.—April 12 to 22 was spent in Louisiana taking notes on a large collection of Triumph strains of potatoes being grown on the New University Farms, Baton Rouge, La., under the direction of Prof. George L. Tiebout, and in accompanying a potato field tour through the Parishes of Lafourche, Terrebonne, and Rapides. The Triumph variety is the only one grown in a commercial way in the state. Probably 90 per cent of the crop being grown was planted with certified seed, a large portion of which was Nebraska-grown stock.

The Delta Farms in Lafourche Parish, of which Mr. M. Mallory is manager, planted two carloads of certified Triumph seed last year, and harvested 38 carloads. The handsome profit derived from the sale of the crop induced the manager to plant 8 carloads of seed this season. In the vicinity of Houma in Terrebonne Parish Farm Bureau, Agent George Arceneau succeeded in getting some of the farmers to plant a carload of certified seed in 1923. The resultant crop from this seed was so satisfactory that 32 carloads of certified Triumph seed potatoes were planted this season..

In Rapides Parish, of which Alexandria is the center, the most of the seed planted was certified stock. The crop in Rapides Parish did not show up as well as in the first two Parishes mentioned. Possibly this may have been due to the fact that it was a week or ten days later. The stand however is not, as a rule, so good and the use of home grown second crop seed is also responsible for the poor showing of some fields.

The study of the strains under trial at Baton Rouge proved to be very interesting in that it included strains from Montana, North Dakota, South Dakota, Wyoming, Nebraska, Minnesota, Wisconsin, and Vermont. Most of these states sent representatives to study the behavior of their respective lots of seed. The gentlemen present were Prof. F. M. Harrington, Agricultural College, Bozeman, Montana; Dr. H. L. Bolley, Agricultural College, N. D.; George Valentine, Agricutural College, Brookings, S. D.; H. O. Werner, Agricultural College, Lincoln, Nebr.; Gus Forshing, Bushnell, Nebr.; Jake Pedrett, Kimball, Nebr.; Melville E. Luther, Agricultural College, Madison, Wis.; and John Scribner, Maine Potato Growers' Exchange, Caribou, Me.

These representatives showed a very keen interest in the behavior of Triumph strains from their home state as compared with those from other states. The wide variation in the percentage of mosaic and spinde tuber diseases in these lots showed that much has yet to be accomplished in the improvement of this variety, as well as that of others. It also convinced those from the Great Plains States, where mosaic readings are difficult to make, that it was extremely desirable to have an opportunity to check up on their seed certification work prior to these lots of potatoes being planted in the North. As a result of this check-up the growers of those lots showing a high mosaic or spindle tuber count will be advised to get new stock.

The writer wishes to emphasize the importance of the work being done at the Louisiana Station under the able leadership of Professor Tiebout and his associates. It is believed that this work has paved the way for a large consumption of certified seed potatoes and incidentally has put many thousands of dollars in the pockets of Louisiana potato growers. It is doubtless also true that growers and seed dealers in neighboring states have materially profited from the Louisiana tests.—**W. Stuart.**

New Jersey.— While wet weather has delayed operations, a large part of the acreage has been planted. One of the outstanding features of this year's crop is the big reduction in acreage devoted to the American Giant variety. One of the biggest seed dealers in Monmouth County reports that this year only 17 per cent of the seed sold by him was the American Giant variety; of the remainder, 23 per cent were Green Mountains and 60 per cent Cobblers. This is of interest, in view of the fact that less than 5 years ago 90 per cent of the seed sold was the American Giant variety.

Another interesting point in connection with this year's crop is the fact that more certified seed has been planted than ever before. There is still poor seed being planted but all dealers report a brisk demand for high grade stock. In addition to the fact that the growers are planting better seed, more attention has been given to seed disinfection. In Monmouth County alone, it is estimated that over 2500 acres will have been planted with treated seed. County Agent Douglass states that 3 years ago, less than 100 acres were planted with disinfected seed.

At the present time, spraying is occupying the attention of many of the growers. The present indications are, that a number of spray rings will be formed in different parts of the state.

During the past several weeks the writer has been busy planting the various experimental plots. On April 10, the northern and southern grown seed test, conducted in co-operation with Prof. Stuart, was planted on the Frank Ott farm at Bridgeton. In this test a comparison is being made of Maine grown Irish Cobblers with the same strain grown one and two years as a late crop in New Jersey, and also Maine grown Green Mountains and the same strain grown one year in New Jersey. This same test has been duplicated at New Brunswick.

During the past week three fertilizer tests conducted in co-operation with the Soil Fertility Office of the U. S. D. A. were planted. In these tests a comparison is being made of sources of nitrogen and potash, amounts of a standard mixture, as well as balanced and unbalanced mixtures.

This year the growers of certified seed were requested to furnish a bushel sample of their seed for test purposes. This seed, consisting of 40 lots, was planted on two farms; one in south and the other in central Jersey. Disease counts and yields will be obtained and those strains showing more than the allowed amount of disease will not be accepted for certification this fall.

The central Jersey growers met recently and decided to conduct the tri-county potato tour on June 23 and 24. This tour will take place in Monmouth, Mercer, and Middlesex counties. Out of state potato growers are invited to attend.—**Dr. W. H. Martin.**

Marathon, N. Y.— Potato market dull; very little business transacted. Dealers are offering 65c per bushel. Certified seed potatoes nearly all sold. Planting not started yet. Expect a normal

acreage to be panted this year; probably increase in seed potato acreage.— **Glenn Carter.**

Suffolk County, N. Y.— My off-hand guess is that the potato acreage in this county will be as large and probably a bit larger this year than in 1923. Potato planting at this time, April 24, is nearly completed. One grower who is planting over 100 acres had his potatoes all planted by about the middle of this month.

I am co-operating with the potato improvement committee of the Suffolk County Farm Bureau in the locating of seven of the large potato seed strain demonstrations this year. A Green Mountain demonstration containing 28 strains has been planted at Mattituck and the same strains have been planted near Port Jefferson and Southampton. Similar demonstrations with Green Mountains, but including different strains, have been located at the State Institute of Applied Agriculture at Farmingdale and in the vicinity of Greenlawn. The Irish Cobbler demonstrations this year are near Southold and Orient. The demonstrations include seed from New York State, Maine, Vermont, Prince Edward Island, New Brunswick, Wisconsin, and New Jersey second crop. In addition, as near as I can estimate, somewhere between 50 and 100 growers are running their own seed source demonstration plots, most of them in a small way of course.

In our efforts to locate some uncertified seed from commercial shipments to this county this year to include in the demonstrations, we found considerable difficulty, due to the fact that with very few exceptions, so far at least as we can discover, certified seed is now exclusively used by the growers here.

A number of the larger seed strain demonstrations will probably be visited on the Long Island potato tour this year, which I expect will include on its route a large proportion of the potato territory in Nassau and Suffolk counties.— **C. R. Inglee.**

Coudersport, Pa.— On March 26th the writer had an opportunity to visit the Coudersport Co-operative Seed Potato Growers' Association storage house located at Coudersport. Our interest in this storage house was awakened at the time of its construction in 1922. The installation of a forced ventilation system late last fall as a result of the stock not keeping satisfactorily during the season of 1922-23 added a further incentive to inspect this storage house. The most interesting observation made during the inspection was that of the relative condition of seed stock stored in bulk in large bins, and similar stock sacked from these bins in late November or early December and piled in tiers with strips of lumber between each layer. The sacks were so placed as to permit of the circulation of air around each sack. The tubers in the bin on March 26th had sprouts varying from one to two or more inches in length and were showing an actual shrinkage in grading for shipment, according to the manager, Mr. P. R. Smith, of approximately 20 per cent, most of which was due to decay. The sacked tubers

on the other hand were not germinated and were being re-conditioned with practically no shrinkage. While this only represents one season's test, and while it may represent an unusually large shrinkage on stock that supposedly went into storage in good condition, it nevertheless furnishes food for thought as to the possibilities in storing potatoes in sacks.—**W. Stuart.**

Norfolk, Va.— Some interesting data from the Division of Crop Estimates concerning crop values has come to our attention recently which we think might be of interest to the readers of the Potato News Bulletin. The average value per acre of farm crops in Virginia in 1923 was in Northampton County—$71.95; Accomac County—$69.82; Norfolk County—$27.67; Princess Anne County —$25.00; and Nansemond County—$23.76; while for the remainder of the counties the value was considerably lower, in some cases as low as $4.00 per acre.

In Northampton County, which leads the list, Irish potatoes are the principal commercial crop and in fact the only crop of any importance grown there. In Accomac County Irish potatoes also lead the list, but sweet potatoes and strawberries are also of considerable importance. It is a significant fact that the crop value per acre in these two counties so greatly exceeds that in other counties of the state and serves to indicate the importance of the potato industry where carried on an extensive scale. In the counties of Norfolk, Princess Anne, and Nansemond, the next three in order of crop value per acre, Irish potatoes are grown to a large extent but not nearly so large a percentage of the acreage is devoted to this crop in these counties as in Northampton and Accomac counties.

In 1923 the Irish potato crop was only about 50 per cent normal, due to a prolonged drought, and the price was not exceedingly high, so that these crop values in the potato counties are not as high as they would be in an exceptionally good season.

The cool weather during the latter part of April has considerably retarded the development of the early Irish potato crop, the plants of which have just appeared above ground in the section around Norfolk and in Northampton County. The plants have developed excellent root systems and should weather conditions be favorable the growth will be very rapid during the next two weeks and the maturity of the crop will possibly not be greatly delayed.— **H. H. Zimmerly, Norfolk, Va., April 30, 1924.**

NOTES ON RECENT LITERATURE

ANONYMOUS. — **Morgan County potato growers are boosting.** — *Colorado Potato Grower* **1**: *No. 5, p. 2, April, 1924.* — The Morgan County Potato Growers Association of the State Exchange is making a strenuous effort to secure 100 per cent mem-

bership of its potato growers. The Association claims that it now controls 90 per cent of the acreage of the district.

The board of directors of the Association recently went on record favoring the use of new bags exclusively for the 1924 crop and placed an order for 50,000 sacks. It is claimed that five cars of certified Minnesota Irish Cobblers and one car of Wisconsin White Rurals have been shipped into the district by the Association at a saving of not less than 25 cents per cwt. under prices asked by local dealers for similar stock.—**W. Stuart.**

ANONYMOUS. — Improved method of seed potato treatment. — ***Colorado Potato Grower*, 1: *No 5, p. 2, April 1924.*** — The writer of this article states that Dr. E. A. Stokdyk of the Kansas State Agricultural College has found that the addition of ammonium chloride to the corrosive sublimate method causes the corrosive sublimate to go into solution more rapidly. The solution is prepared by dissolving 4 ounces of corrosive sublimate and 4 ounces of ammonium chloride in one gallon of hot water in a wooden bucket. This concentrated solution is then poured into a barrel or wooden tank and diluted with 29 gallons of water thus giving the standard solution.—**W. Stuart.**

ANONYMOUS. — Importance of potash for potatoes demonstrated. — ***The News Bulletin issued by the Soil Improvement Committee* 8:, *No. 6, p. 59, April, 1924.***—In 1923 the Massachusetts Extension Service of the Agricultural College made a definite attempt to measure the effect of potash on potatoes and carrots. Five different treatments were compared as follows:—(1) No fertilizer, (2) 0-8-10, (3) 5-8-0, (4) 5-8-5, (5) 5-8-10. Throughout the season the 5-8-5 and 5-8-10 plots were distinctly greener, while on the 0-8-10 plot the plants appeared to be much dwarfed in midsummer and died a month or 6 weeks before the other plants had ripened. The yields secured were in accordance with the general appearance of the growing plants as is evident from the data presented.

	Yield in Bushels Per Acre		
Treatment	**No. 1's**	**No. 2's**	**Total**
No fertilizer	73.0	17	90.0
5-8-0	64.5	35.5	100.0
5-8-5	166.0	19.0	185.0
5-8-10	189.0	16.0	205.0
0-8-10	(No yields taken)		

These data are of course only indicative of the general value of potash on the particular type of soil on which these tests were made.—**W. Stuart.**

ANONYMOUS. — Kansas organizes a 400 bushel potato club. — ***The News Bulletin* — *Issued by the Soil Improvement Committee* 8: *58, April, 1924.***—The Kansas State Agricultural College is sponsoring an organization, membership in which is restricted to

those farmers who shall grow 400 or more bushels per acre. This is believed to be the second 400 bushel club in the country, Pennsylvania having the credit of being the first club.—**W. Stuart.**

GAYLORD, F. C. — **300 bushels of spuds per acre.** — *The Farm Journal,* 48: *4, April, 1924.* — The author points out that seed and soil are the biggest factors in securing large yields which were demonstrated by 20,000 Indiana farmers who last year used certified Early Ohios, Irish Cobblers and Rurals for the first time. Twenty thousand bushels of certified seed potatoes in one county in Indiana produced an increase of 35 per cent as compared with yields from common seed grown alongside of it. Many growers received large increases due to certified seed. The varieties mentioned above are recommended for Indiana. The author also recommends from 15 to 25 bushels of seed per acre, level cultivation and good care throughout the season.—**W. M. Peacock.**

COONS, G. H. AND KOTILA, J. E. — **Michigan potato diseases.** — *Michigan Agricultural Experiment Station Special Bul. 125, pp. 1-55, 44 figs. Dec., 1923.* — —According to the authors: "The bulletin is a brief handbook of potato diseases. The diseases are arranged according to methods of control employed and the salient facts about each disease are given in connection with an illustration which shows the characteristic signs by which the disease may be recognized. The causal agent when known is discussed and its life history told. Methods of control based upon life history of the parasite are then given. These control measures are general and outline the principle involved in the treatment. A definite program recommended for potato growers is given on the last pages of the bulletin." The discussion of the various potato diseases is illuminative and instructive, and the illustrative material used is very helpful to an intelligent understanding of the outward or physical characteristics of different diseases.—**W. Stuart.**

DEAN, DANIEL. — **Making potatoes dig for water.** — *Pennsylvania Farmer* 89: *500 and 519, April 12, 1924.*—The author emphasizes the value of having the potato plants root deeply in tiding them over periods of drought. He encourages deep root penetration of the soil by his well known practice of sub-surface application of commercial fertilizers. The fertilizer is broadcasted in the spring over fall-plowed land and then thoroughly disced in, after which the land is re-plowed to a depth of 9 to 10 inches. Stated in the author's own words, "the object is to take the upper layer of the soil well mixed with 2,000 pounds of fertilizer per acre and place it at the bottom of the furrow, under another layer of soil brought up from below which contains little or no fertilizer. This new upper layer is thoroughly tilled for nearly two months by the use of the disc and spring-tooth harrows, the planter, the cultivators, the plank level, and weeder used in tillage." The presence of the fertilizer in the lower level of soil and its splendid

tilth encourages the roots of the potato plant to not only penetrate this layer but also to make an extensive root system, and thereby insures the plant an abundant moisture supply during short drought periods or even prolonged ones. Tuber malformation and hollow centers are also discussed.—**W. Stuart.**

MUSGRAVE, G. W. — **Size of potato seed piece. — Some pros and cons.** — *Hints to Potato Growers* 4: *No. 12, p. 1-3, April, 1924.*— The author first quotes results of a survey in New York State of 1290 potato farms in which the data shows that the farms using the larger quantities of seed per acre obtained the largest yields. In an earlier survey conducted by the New Jersey Station it was found that the average quantity of seed used in Central New Jersey was 14.3 bushels per acre. Based on the normal planting distance in this section the average weight of the seed piece would be about 7-8 of an ounce.

During the past five years the department of agronomy of the New Jersey Experiment Station has conducted a size of seed experiment at Mt. Holly, Cranbury, Hightstown, Dayton, Farmingdale, and New Brunswick, N. J., from which results were obtained on both good and poor soils. The varieties used included American Giant, Green Mountain and Irish Cobbler from mature northern-grown seed. In all of these tests the largest gross yield was obtained with the larger size of seed piece,—the size used ranging from one-half to four ounces. The largest net yield, or yield ob tained after subtracting the seed used, was, however, invariably obtained with the smaller size of seed piece, usuall 1½ ounces. The differences in favor of the larger sizes were greater on the poorer soils.

In a test at Farmingdale last year, which is considered typical of the tests at other points, the following data was secured:

Size of Potato Seed Piece Test, Farmingdale, 1923

Weight of seed piece	Yield per acre in bushels	Amount of seed used per acre	Net yield after subtracting seed	Percentage of seconds to total weight
½ ounce	138.52	8.25	130.27	10.3
1 ounce	165.70	16.50	140.20	10.7
1½ ounce	180.30	24.75	155.56	10.7
2 ounce	185.40	33.00	152.40	17.7

The author then compares the value of each of these yields, above that of the seed used, and finds their values per acre to be as follows:

½ ounce seed piece, $102.05; 1 ounce, $112.12; 1½ ounce, $111.82; 2 ounce, $103.64.

It is proposed to conduct a further test this season (1924) in which three of the better sizes are to be used.—**W. Stuart.**

SANDERS, V. A. AND STEVENS, C. D. — *New England Crop and Live Stock Review 1923, pp. 1-73. Issued by the New England*

Crop-Reporting Service.—On page 4 in this publication, under the caption, "Potato Production 23 per cent Above Average," the author makes the following statement: "On an acreage which in 1923 was 5 per cent below the five-year average (1918-22) the total potato crop was 23 per cent above the average. This illustrates clearly the influence of favorable weather and shows the possibilities of potato production in New England under favorable conditions. The cool season was favorable to potatoes and only in Connecticut and northern Maine did lack of rainfall reduce yields." In chart III the authors show the relative total value of the principal crops of New England, while in map 1, page 5, they show potato production of New England by States by black dots. The relative value of the principal crops are then shown by states in charts IV to IX. In Maine the value of the potato crop is estimated at 22.4 million dollars, while the value of hay, its nearest competitor, is valued at 21.7 million dollars. New Hampshire's potato crop is valued at 2.8 millions, while that of hay is worth 10.2 millions of dollars. The potato crop of Vermont is valued at 4.3 millions, while hay is worth 21.3 millions of dollars. Massachusetts potato crop was worth 6.1 millions of dollars and hay 15.7 millions. Rhode Island potatoes are only valued at 0.4 million dollars, as compared with 1.5 millions for hay. The Connecticut potato crop is valued at 5.2 millions of dollars, the hay crop at 10.1 millions and the tobacco crop at 18.7 millions. Copies of this publication can be purchased from V. A. Sanders, Wakefield, Mass., for 10 cents per copy.—**W. Stuart.**

STOUT, A. B. AND CLARK, C. F. — Sterilities of wild and cultivated potatoes with reference to breeding from seed. — *U. S. Dep't. Agr. Dep't. Bul. 1195, pp 1-32 pl. I-VIII, March, 1924.* — The authors discuss the importance of reproduction from true seeds and claim that nearly all of the most valuable varieties now in cultivation were obtained from seed. It is further asserted that the most immediate demand for seed reproduction is in the need for varieties resistant to diseases such as mosaic and leafroll. Sterility of many of our cultivated varieties is regarded as one of the greatest obstacles to success in potato breeding. The studies upon which the report is based were conducted at Presque Isle, Me., during the seasons of 1920, 1921, and 1922. The materials used consisted of a rather large collection of named varieties and of Department seedlings, which afforded an unusually good opportunity to observe the behavior of groups and varieties within groups and also sterility inheritance in seedlings. Two types of sterility are thought to be especially concerned with the lack of potency. (1) The sterility of hybridity which typically affects both male and female organs alike and (2) the condition of intersexes which tends to give a one-sided sterility or abortion. A study of maleness and of the grades of pollen sterility present in a variety can be determined by an examination of the stamens as to

the size of the pollen chambers and their dehiscence, of the pollen as to its appearance, its viability in proper media, and its ability to function in fertilization when used to pollinate varieties known to be highly capapble of producing fruit. The potency of pistils can be determined by pollinating them with pollen known to be highly functional. In a careful study of the best media to use in pollen germination it was found that a media composed of 1 gram of agar and 15 grams cane sugar to 100 cubic centimeters of distilled water gave the most satisfactory results.

The authors present two systems of classification each consisting of four divisions. The first classification is based on the condition of the anthers, the quantity of pollen shed, the relative number of grains possessing granular contents and the extent and vigor of germination of pollen of the cultivated varieties. The second classification is based on the innate ability of varieties to produce seed when the pollinations involve pollen that is highly potent and viable and are made when flowers open in abundance.

The authors summarize their report as follows:

"The nonblooming habit of the potato with early abcission of the flower buds and flowers when grown under certain conditions is a direct influence of environment. Varieties which bloom in profusion in northern Maine rarely or never bloom at the New York Botanical Garden. This habit is a most decided limitation to fruit production, irrespective of the condition of pistils and stamens when flowers are produced.

Relatively few of the cultivated varieties and seedlings produce viable pollen in considerable quantities and are able to function as pollen parents. The highest potency of pollen is decidedly low.

Nearly all varieties, if not all, are able under conditions of favorable blooming to produce seed balls in response to proper pollination with viable pollen.

As a group the cultivated varieties of the potato exhibit a one-sided sterility which chiefly involves maleness.

There is no conclusive evidence of a real physiological incompatibility in the fertilization of cultvated varieties, but there is positive evidence of such sterility in the wild species Solanum chacoense.

F_1 hybrids between S. fendleri and S. chaconese appear to be completely impotent as males and also as functional females.

Breeding from seed in potatoes can best be undertaken when varieties bloom in profusion. Under such conditions success in obtaining seeds depends chiefly on the use of pollen that is viable.

So far as this study has been made, pollen in anthers of fully mature flowers of any one variety appears to be very constant in quantity, range of abortion, general character, and viability.

The production of tubers in which much food is stored does not directly influence and prohibit the formation of fruit by the potato."

—W. Stuart.

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TICE, CECIL. — The British Columbia potato. — *British Columbia Dep't. Agr. Bul. 86, pp. 1-84, 76 figs., 1924.* — This bulletin, as stated by the author, is a revised edition of former bulletin 86 entitled, "The Potato in British Columbia." The author's table of contents embraces many subjects, such as

"The history of the potato; its botanical characters; quality in potatoes; food values; cooking; production; consumption; potato growing areas in the province; climate; relation between temperature and yield; soils; rota-

tion; manures; fertilizers, and lime; preparation of the land; early potatoes; seed; planting and cultural methods; irrigation; harvesting; picking, sorting and grading; storage; marketing; disposal of cull potatoes; preparation of cars for shipping potatoes; the cost of growing potatoes; field crop competition; improvement of varieties; classification of varieties; description of varieties; preparation of exhibits; insect pests; potato diseases; general principles in the control of diseases; disinfection of seed potatoes; spraying; spray mixtures; acknowledgements; potato recipes; regulating sale of seed potatoes; imports and exports of potatoes."

The 76 illustrations used by the author in this bulletin give the reader a very clear understanding of cultural practices, potato implements, and nature of insect and disease pests. It should prove very helpful to the potato growers of British Columbia, and incidentally to those of other sections as well.—**W. Stuart.**

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ZUNDEL, GEORGE L. — Dipping seed potatoes. — *State College of Washington Extension Service Bul. 112, pp. 1-12, figs. 11, March, 1924.*— The author discusses the object of seed treatment; preparations of the seed potatoes for treatment, dissolving the corrosive sublimate and the precautionary measures to be observed in its use, and treating vats. Soil sanitation is discussed under crop rotation, and inoculaed sulphur applications. The publication is well illustrated.—**W. Stuart.**

Anniversary Announcement

IT IS NOT TOO LATE

to order foundation seed stock from which to grow Certified seed in 1924. The Certified Green Mountain, Russet, Heavyweight, Carman, Rural New Yorker, Number Nine, and Cobbler strains, which our members are now growing, represent the best they have been able to discover and develop during the ten years they have been co-operating in an organized way witth the New York State College of Agriculture.

The growers who buy foundation seed stock of us now have a ten-year start on the road to successful seed growing. INSPECTION RECORD STAMPED ON THE CERTIFICATION TAG ATTACHED TO EACH SACK. Write for catalogue.

New York Cooperative Seed Potato Association

214-215 Wieting Blk., SYRACUSE, N. Y.

MISCELLANEOUS PAPERS

POTATO GROWING

Daniel Dean, Nichols, N. Y.

The writer says amen to the whole article entitled, "The 1924 potato crop:—to ensure returns—reduce costs—improve quality—market efficiently," by Wm. H. Martin, *"Hints to Potato Growers 4:11, March, 1924."* Although, perhaps I would put the matter in a little different way.

I would emphasize the fact that labor price costs are double those of pre-war times, while potato prices are far from that scale. The cost of fertilizer is low. Good seed is, perhaps, expensive; but poor seed is more expensive. Spraying and disinfection are very cheap in comparison with other costs. Hence it will never pay the 1924 potato grower to produce 1913 yields, with the quantity of labor he used in 1913. He must reduce labor costs, use a reasonable amount of fertilizer, plant high grade treated seed, and spray thoroughly.

In reference to marketing, the writer has been getting large premiums in price for many years over what dealers receive in this section, by shipping carloads of high uniform quality to markets which know my stock so well that the premium is cheerfully paid. High grade stock is absolutely essential if grading is to be a success.

When it comes to spraying, the writer has stuck to the traction sprayer, because the present power sprayers are practically of the same size as the traction sprayers with the added weight, cost and unreliability of the gas engine. The writer has been visiting a number of sprayer factories to persuade them to produce a potato power sprayer which would compare with the big orchard sprayer, i. e., 6 rows, 12 to 18 nozzles, etc.

As to choice of varieties, the writer has found the Rural New Yorker No. 2 and Russet Rural well adapted to the soil and climatic conditions in southern New York. The former is sold in the markets which discriminate against potatoes with a russet skin, such as the New York market. The Russet Rurals are sold in those markets that don't make this discrimination. There is no getting around the fact that the Russet Rural variety yields better, and that the Rural New York No. 2, with its smooth skin, sells better, at least part of the time.

TWO TYPES OF POTATO GROWERS

Daniel Dean, Nichols, N. Y.

Sellers of seed potatoes often note two sharply distinct types of buyers of their product. One is made up of conservative and business-like potato growers who stick to a definite plan of production through thick and thin. They make potatoes the principal farm enterprise in a well-rounded rotation of crops. Their production cost per bushel is low, for they keep up soil condition by judicious rotation, and their farm business is in smooth running order from one year to the next, with labor, seed, and machinery always ready in time at minimum cost. The other type is the speculative plunger who rushes into potatoes the spring after a short crop has caused high prices in the winter. He buys large quantities of high-priced seed, only to often fail in the crop production because of ignorance of fundamental principles of potato growing. In any case, his production cost per bushel is higher than that of the other class of growers because of inexperience.

One New York grower who sells large quantities of seed potatoes each year notes that this spring the latter class of seed buyer has nearly disappeared. But the business potato grower is buying more seed than ever, and wants the best seed he can get, knowing that poor seed is dear at any price.

NEW YORK AS A POTATO-SHIPPING STATE

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The United States Department of Agriculuture still lists New York as one of the 19 surplus late potato states. This means that on the average the state produces enough potatoes to satisfy the per capita consumption requirements of her 10,000,000 odd inhabitants. Of the total crop of about 37,000,000 bushels produced annually it is estimated that about 50 per cent is consumed on the farm where grown, 25 per cent is shipped in carlots, and the remaining 25 per cent is trucked to market. These percentages are also nearly average for the United States according to figures published recently by the Bureau of Agricultural Economics of the United States Department of Agriculture. So far as car shipment of potatoes is concerned New York usually ranks fourth to the States of Minnesota, Maine and Wisconsin in the order named. Only three states in the country annually ship over 50 per cent of their total production namely, Idaho, Colorado and Maine.

The proportion of the crop marketed by motor truck depends mainly upon proximity of the producing region to consuming centers and highway transportation facilities. Such producing regions as central and south Jersey, eastern Pennsylvania and Nassau, Erie, Monroe and Onondaga Counties in New York, market most of the crop by trucking to the large cities in these respective territories. Thus it is that the figures showing carlot unloads of potatoes in some of our largest cities are considerably reduced because of truck receipts. In general, however, the carlot receipts of potatoes vary with the population in the csonsuming centers.

The following table indicates the number of cars of potatoes shipped from each of the leading potato loading stations in New York during the record crop year of 1922-1923:

Station	County	No. Cars	Station	County	No. Cars
Riverhead	Suffolk	1041	Peconic	Suffolk	251
Bridgehampton	Suffolk	783	Prattsburg	Steuben	228
Mattituck	Suffolk	624	Gainesville	Wyoming	228
Cutchogue	Suffolk	551	Cadyville	Clinton	213
Calverton	Suffolk	520	Andover	Allegany	207
Jamesport	Suffolk	510	Wellsville	Allegany	207
Water Mill	Suffolk	507	Laurel	Suffolk	201
Southold	Suffolk	457	Chateaugay	Franklin	199
Southampton	Suffolk	370	Atlanta	Steuben	192
Aquebogue	Suffolk	283	Avoca	Steuben	186
Wallace	Steuben	270	Arkport	Steuben	186
Wayland	Steuben	269	Naples	Ontario	182
Wainscott	Suffolk	263	Victor	Ontario	176
Cohocton	Steuben	252			

It will be interesting to observe in the table that of the 27 loading stations shipping over 175 cars, 13 or about half of them are in Suffolk County. Riverhead holds the record of 1041 cars, the largest number ever shipped from any one loading point in New York State. Of the total of 19,235 cars loaded in New York during the year 1922-1923, over one-third or 37.4 per cent were shipped from Suffolk County. Although Erie, Monroe and Onondaga Counties rank high in production, a large proportion of the crop from these counties is marketed by motor trucks in the cities of Buffalo, Rochester and Syracuse.

The following figures showing the primary destination of the carred crop from Western New York, indicate that 65.6 per cent of it is received in the 10 cities listed:

City	No. Cars
New York	2339
Newark	502
Brooklyn	463
Philadelphia	312
Cleveland	274
Pittsburgh	270
Scranton	236
Baltimore	196
Albany	174
Jersey City	155

For reasons indicated above, the cities of Buffalo, Rochester, and Syracuse do not appear in this list.

THE PRESENT STATUS OF INVESTIGATION OF VARIETAL RESISTANCE TO DISEASE IN THE POTATO

By Freeman Weiss and Philip Brierley, U. S. Dept. of Agr.

(Part 2)

Late Blight and Tuber Rot (Phytophthora infestans)

Mention has already been made of the extensive co-operative tests of varietal reaction to late blight and tuber rot conducted at the Vermont and Maine Stations. In reporting his part in this work, Stuart (30) concludes that some varieties are resistant to foliage blight and some to tuber rot, but there is no universal relation between rot and foliage injury. German and Holland varieties as a group are more resistant to rot than British, which in turn are more resistant than French and American sorts. Foreign resistant varieties and the more resistant American strains are in general unsuited in quality or productiveness for commercial use in this country. Hill selection, in Stuart's experience, did not increase the blight resistance of a strain. Many instances of "blight-proof" selections have been reported, and doubtless many more apparent successes along this line have gone without record, but, although the possibility must be granted that such desirable sports may appear, none of the reported instances can be considered valid until more cititical evidence of resistance to blight and freedom from degenration diseases is obtained. It has been observed by both growers and pathologists that the "giant hills" which occur in Rural New Yorker are commonly less affected by blight than normal plants. Selection of these or similar aberrant types for blight resistance has proved to be unprofitable. The hope of utilizing other species of Solanum as resistant parents to

produce an immune commercial variety by hybridization has been abandoned in England and in this country (30) but such work is still in progress in France (2) and Germany. Certain potato districts in America and most of the European and other potato producing countries possess varieties esteemed for relative freedom from injury by blight, at least in ordinary years. One of the most promising of these is Ekishirazu, a Japanese variety of seedling origin, which has been subjected to critical tests and proved practically immune to blight. Attempts to cross this variety with more valuable commercial sorts have been successful and further work is in progress at the Cornell Station (23).

Early Blight (Macrosporium Solani)

The most extensive observations on susceptibility to leaf-injury by early blight were conducted by Stuart (31) through a period of five years at the Vermont Station. His data showed much variation from year to year in percentage of leaves affected in a given variety. Unfortunately, the several foreign varieties and the single American variety, Late Blightless, which were most resistant were considered of no commercial value in this country. Experimental tests of more limited scope at the West Virginia (22), Ohio (7), and Maine (34) stations, and recent information from the Plant Disease Survey (19) indicate a somewhat lower susceptibility to early blight in certain varieties of the Rural and Green Mountain groups than in Cobbler, Ohio, and Triumph.

Common Scab (Actinomyces)

Resistance to common scab is more frequent among European than American varieties, a number of German and English sorts resisting this disease to an appreciable extent, although no approach to immunity is known. Wollenweber (33) in his tabulation of the reaction of fourteen German varieties to nine of the commoner diseases, classes Wohltmann as definitely resistant and seven others as limited in resistance.

The Vermont Station has furnished an important part of our information in regard to scab reactions of American potatoes, although a considerable amount of earlier work has been reported by other stations. Jones and Morse (12) found Sir Walter Raleigh comparatively resistant in a two-year test; Green Mountain, although relatively free in one year, was among the most severely affected in the other. In two years of subsequent work at the same station, Stuart (31) found Million Dollar, a smooth Rural type, to be more resistant than other American varieties and comparable with the best German and English varieties, although none showed "strongly marked" scab resistance when grown on thoroughly infested soil. Attempts to obtain scab-free strains by hill selection offered no promise of success. Cambridge Russet was

notably less resistant than a number of the European varieties, an observation which prompted Stuart to discredit the popular conception that russet skins resist scab. However, Lutman (15) presents convincing evidence from four years of comparative tests at the Vermont Station that the russet type of tuber, and more especially Burbank Russet and its allies, Cambridge Russet and Scab Proof, have marked resistance to this disease. The "semi-russets" such as Dibble's Russet, show some resistance, but thin-skinned varieties such as Green Mountain, Early Ohio, and Beauty of Hebron, seem to be most susceptible. Lutman was able to demonstrate further that thick skins and "close-textured lenticels, partly buried under the skin surface" are associated with the russet type. The apparent disagreement in the findings of Stuart and Lutman is readily explained when we consider that Stuart compared Cambridge Russet with a select collection of scab-resistant European varieties, whereas Lutman compared it with commercial American varieties, many of which are notably subject to scab. The point seems well established that the Russet Burbank type and some varieties of the Rural group are significantly more resistant than other commercial varieties, and actual experience is dictating the use of these varieties, within their favored ranges in sections where scab is a major problem.

Mosaic, Leafroll, Streak, and Spindle-Tuber

There are numerous claims in European literature that varietal differences with respect to these diseases have been observed. However, contrary to the situation with the parasitic diseases, previous history of the stock in question is of so great importance that mere observational evidence is of little value. It is necessary to know how much disease was present in each seed lot at the start of the experiment and whether exposure to insect carriers has been uniform throughout the season. There is a general impression that susceptibility to leafroll usually accompanies resistance to mosaic, and vice versa; thus Rural New Yorker and Irish Cobbler are held to be more subject to leafroll, whereas Green Mountain and Triumph more frequently exhibit mosaic. (Murphy and others, 17.) A similar reciprocal relationship to these two diseases has been stated to occur in certain European varieties.

In Maine, Irish Cobbler seldom shows more than a trace of mosaic and is the only variety which may show a considerable proportion of leafroll in commercial fields (Schultz and Folsom 27. On the other hand Gilbert (6) finds that in Vermont, Irish Cobbler may have more than a trace of mosaic and Green Mountain may often be affected with leafroll.

The extensive intervarietal inoculations performed by Schultz and Folsom (28) in which as near an approach as has hitherto been possible was made to working with "pure cultures" of the disease

producing factor and to basing all comparisons on the sypmtoms exhibited by "standard hosts," have led to the following tentative conclusions: "The several degeneration diseases (three types of mosaic, streak, leafroll, and spindle-tuber) described as being diagnosed and transmitted within the Green Mountain variety are also present in other varieties (Cobbler, Triumph, Rural) according to the results of intervarietal inoculations." It is still doubtful whether mild mosaic can be communicated to Irish Cobbler, with or without visible symptoms, but rugose mosaic may readily be induced by inoculation. The evidence is still inadequate to support any conclusions as to resistance to these diseases in any variety.

There is a widespread opinion among potato growers that the Rural New Yorker and its allied forms are resistant to heat and drought. Obviously a number of factors are concerned in determining resistace to the complex of conditions termed drought injury. Among such factors are resistance to heat and water loss, or water deficit, of themselves, and also resistance to numerous insects which injure the leaves and suck the sap. There are no comprehensive data extant on the relative water requirement of different varieties of potatoes, nor is it known whether there are varietal differences in structure, which affect the economy of water utilization, or resistance to injury from its excessive loss.

The disease known as hopperburn which is often associated with, and sometimes is not distinguished from drought injury, is the only one of these factors in which varietal differences in susceptibility have been studied extensively.

Fenton and Hartzell (5) have shown that in general tolerance of hopperburn is greatest in Rural New Yorker, followed by Green Mountain, Irish Cobbler, Early Rose, and Triumph. However, the amount of injury from hopperburn is influenced by other factors than preference of the insects for one variety above another, or resistance of the variety to their attack. The small size, inferior succulence, and slow growth of the Rural type during mid-summer result in its escaping the bulk of the first and second broods of insects, and it forms its crop of tubers when the leaf-hoppers are least numerous.

Stem and Crown Injury Due to Rhizoctonia

The reports submitted by collaborators of the Plant Disease Survey of the U. S. Department of Agriculture have not recorded varietal differences in the amount of injury caused by Rhizoctonia. However, Wollenweber (33) names five German varieties, including Wohltmann, which figures prominently in accounts of resistance to several other diseases, in which he states "resistance is definitely present" to Rhizoctonia root rot and sprout injury.

Wilt, Stem Rot, and Root Rot Caused by Fusarium sp. and by Verticillium

Information regarding varietal differences toward this group of diseases is particularly meager, partly owing to limited observations, but particularly to the confusion that exists as to the species of parasitic organisms responsible for the various symptoms, and as to the proportionate effect which is to be ascribed to root destruction, occlusion of water ducts, liberation of toxins, and direct injury to the stem. Wollenweber cites several German varieties as resistant to Verticillium wilt. Resistance to wilt and footrot caused by species of Fusarium is well known in other crops, as cowpea, flax, and cabbage, these examples being almost classical in the general history of disease resistant varieties. Thus there are a priori grounds for expecting different degrees of susceptibility to etiologically similar diseases in the potato. However, the literature affords for the most part, only instances of susceptibility to these diseases. Thus Haskell (9) found wilt occurring to a variable degree among 40 varieties, representing 9 of Stuart's groups, but there was no evidence of pronounced resistance. Similarly Pratt (20) states that field blackrot in the western states affects both the long- and round-tubered varieties of that region, although the symptoms differ in the two types. Edson's (4) results indicate that Pearl, Rural New Yorker, and Early Ohio showed a tendency to recover from a wilt diseased condition late in the season. It is of course to be expected that early varieties, as Cobbler and Triumph, frequently may more or less completely escape injury by wilt, owing to the maximum development of the diesase occurring in mid-season or later.

Tuber Rot Caused by Fusarium sp.

The comparative readiness with which tubers rot when inoculated with different species of pathogenic Fusaria has been investigated in several instances. Wilcox, et al. (32) observed that only slight differences in the extent of rotting occurred in 13 varieties of tubers inoculated with Fusarium tricothecioides. Pratt (21) found that 7 varieties, including Burbank, Early Rose, Idaho Rural, Pearl, and Peachblow were equally susceptible to rot induced by F. tricothecioides. On the other hand, Pethybridge and Lafferty (18) have apparently disclosed real differences in the susceptibility of several British varieties to dry rot caused by F. coeruleum. The age and condition of the tuber are important factors in conditioning the rate of rotting, but in the experiment cited the different varieties were comparable in this respect. Early varieties were found to be particularly subject to dry rot.

Miscellaneous Diseases

No evidence of resistance to blackleg and bacterial rot in commercial American varieties has appeared; references to this subject merely point out varieties particularly susceptible to the disease, such mention being made of Irish Cobbler, Green Mountain, Early Ohio, and Burbank (11). In England, too, susceptibles only are listed (3). Appel (1) considered the thick-skinned, late varieties of Germany, particularly Dabersche, to be more resistant than the thin-skinned, starch-poor early varieties.

Hawkins and Harvey (10) found white McCormick resistant to artificial infection by the leak pathogene (Pythium de Baryanum); Bliss Triumph and Green Mountain were very susceptible.

In summing up this examination of all data at hand dealing with disease resistance in the potato, it remains only to point out that as yet no striking example of general resistance to disease is known in any European or American variety of commercial importance, although a number of well-known European varieties appear to be superior in disease resistance to our varieties. There seems to be some evidence that resistance to several diseases may be combined within one variety, as Harris has suggested in the case of late and early blight, and scab. Wollenweber also has shown that certain German varieties are more or less resistant to a group of troublesome diseases. This condition is a real gain toward the ultimate solution of the problem of disease control in the potato. It means, as seems also to be true among domestic animals and man, that longevity and vigorous health are to a considerable extent predisposed by heredity. There are of course some diseases which attack vigorous and generally speaking disease-resistant plants. These are special instances and often are subject to control by other measures. Though it may be an unattainable aim to combine resistance to all diseases with the necessary qualities of productiveness, appearance, and food value, which characterize a good commercial potato, it seems possible that resistance to a number of parasitic foliage diseases may be bred into one variety, perhaps resistance to foot and root rots in another, and eventually resistance to the degeneration diseases in still others. This would greatly simplify the problem of disease control. There would seem to be little place for any new introduction that does not fulfil at least one of these three requirements.

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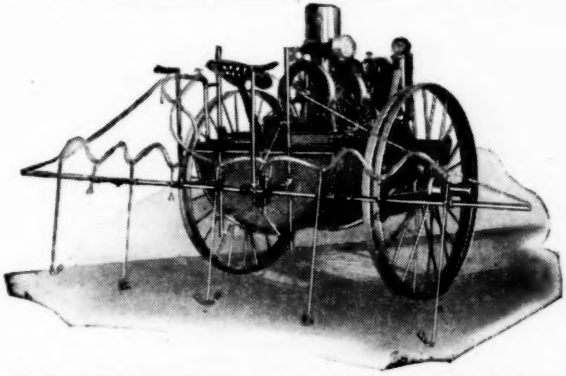

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